

## REMARKS

Claims 3, 5, 10 and 11 were rejected under 35 U.S.C. §112 (2d paragraph) as being indefinite.

Claim 3 was considered to be unclear whether the molar ratio recited refers to the initial reaction or the final ratio. As amended, it is clear that the ratio refers to step 1(c). Thus, claim 3 is a limitation on the molar ratio recited in claim 1 and is a preferred range as supported in the specification on page 4, lines 20-22.

Similarly, claim 5 was considered to be unclear at which point in claim 1 the pH should be 9.5 to 11.5. As amended, this point is in step (c). This is the preferred range for the pH as supported in the specification on page 7, lines 13-15.

Claim 1 has been further amended to incorporate claim 10, claim 10 being canceled herein without prejudice or disclaimer. This clarifies the Examiner's question concerning inulin being present in step (a). Note that the Office Action on page 3, first paragraph, lines 4 and 5 should read "claims 10 and 11" instead of "claims 9 and 10".

Claim 11 has been amended to depend from amended claim 1.

Claims 1-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Verraest et al* in view of *Raehse et al*.

The claimed method can serve for preparing carboxymethylinulin with e.g. a degree of substitution of 1.5-3. The prior art manufacturing technologies were deficient in yielding low degrees of substitution, and low yields and selectivity. It was known that chloroalkylcarboxylate can react with water leading to the undesired formation of glycolic acid and diglycolic acid. One approach can thus reside in reducing, as much as possible, the amount of water in the reaction

mixture. However at high concentrations, inulin forms a particle gel leading to high viscosity and severe mixing problems -- see e.g. *Verraest et al*, page 103, second paragraph and kneading problems. The applicant has found that, unexpectedly, the viscosity of the inulin gel can be reduced significantly by using a slurry of halogen alkylcarboxylate and inulin. The unusual benefits which can be secured are, by any standard, unobvious. Another meaningful difference with respect to the prior art resides in the order of addition of the reagents. The halogen alkylcarboxylate and the alkali hydroxide are added simultaneously (concurrently) to the slurry of step (b). Support is found in the abstract and specification (page 4, lines 1-3; page 7, lines 3-5, examples 2, 3 and 4). This was found to be a key measure for solving/avoiding the prior art viscosity problems. It is emphasized that neither *Verraest et al* nor *Raehse et al*, taken singly or in combination, are in any manner suggestive of the applicant's inventive arrangement. *Verraest et al* teaches a low degree of substitution, generally below 1. The highest degree of substitution (DS) of *Verraest et al* is 1.05 -- page 111, second paragraph. *Verraest's* teachings do not lead to the claimed technology and constitutes, in fact, a prime example of the unsuitable art technology.

*Raehse et al* teaches a multistage carboxymethylation. *Raehse et al* actually teaches a process for preparing substituted carboxyalkyl cellulose, DS 1.0-2.8, with two, DS up to about 1.5, or three, DS up to about 2.0, carboxymethylation steps by first suspending cellulose under stirring in a solvent, followed by adding monochloroacetic acid solution. This first stage reaction mixture (very viscous) is worked up after neutralization and solvent addition. The comparable second stage is then carried out (see *Raehse et al*, column 8, 11. 0-20).

*Raehse et al* in fact needs three successive carboxymethylation trials to yield a product having a DS above 1.5. The individual steps are based on technologies known in the art. They

are flawed by viscosity problems, and require substantial levels of solvents to control viscosity although the method is affected by yield insufficiencies. The applicant's claimed process, steps (a), (b) and (c), is straightforward while *Raehse et al* has to repeat a complicated and expensive arrangement three times to secure a result that is still unsatisfactory. Isn't that what inventive activity is all about?

To summarize, even the combination of *Verraest et al* and *Raehse et al* does not teach the inventive process, and in fact, teach away from the present application.

In particular, the combination of *Verraest et al* and *Raehse et al* does not teach to prepare a dispersion of the halogen alkylcarboxylate (containing -- if any -- only minor amounts of inulin) (step a) and adding the bulk of the inulin to this dispersion (step b). The technical effect of this step can be seen from the comparative tests in example 1. If inulin is added to water, the viscosity of the dispersion becomes extremely high. In addition the references do not teach to add further halogen alkylcarboxylate and alkali hydroxide concurrently.

The technical consequences of the lack of this "inventive sequence" is beautifully illustrated by the cited references. The process of *Verraest et al* leads to a low level of substitution. According to *Raehse et al* one either has to accept a low level of substitution, or deal with a high viscosity, or the reaction has to be carried out in two or three cycles.

The same or better results are achieved by the invention in one cycle.

Accordingly, the process of the invention is not obvious with respect to the cited references. It therefore appears that claims 1-9 and 11 are distinct from the art of record, taken

individually or combined, and meet the patentability requirements. Allowance of claims 1-9 and 11 is respectfully requested.

*Nov 19, 2009*

Date

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Date: November 19, 2009  
Express Mail Label No. EH615482946US

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